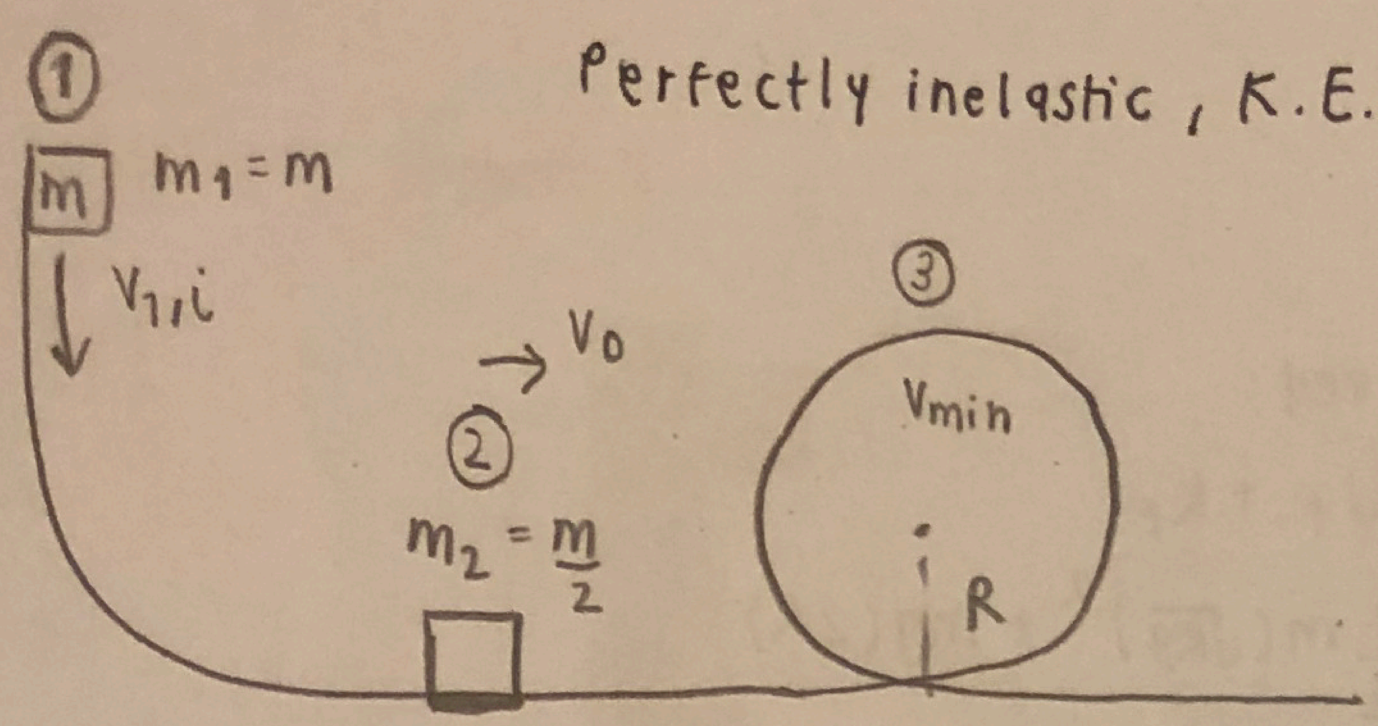
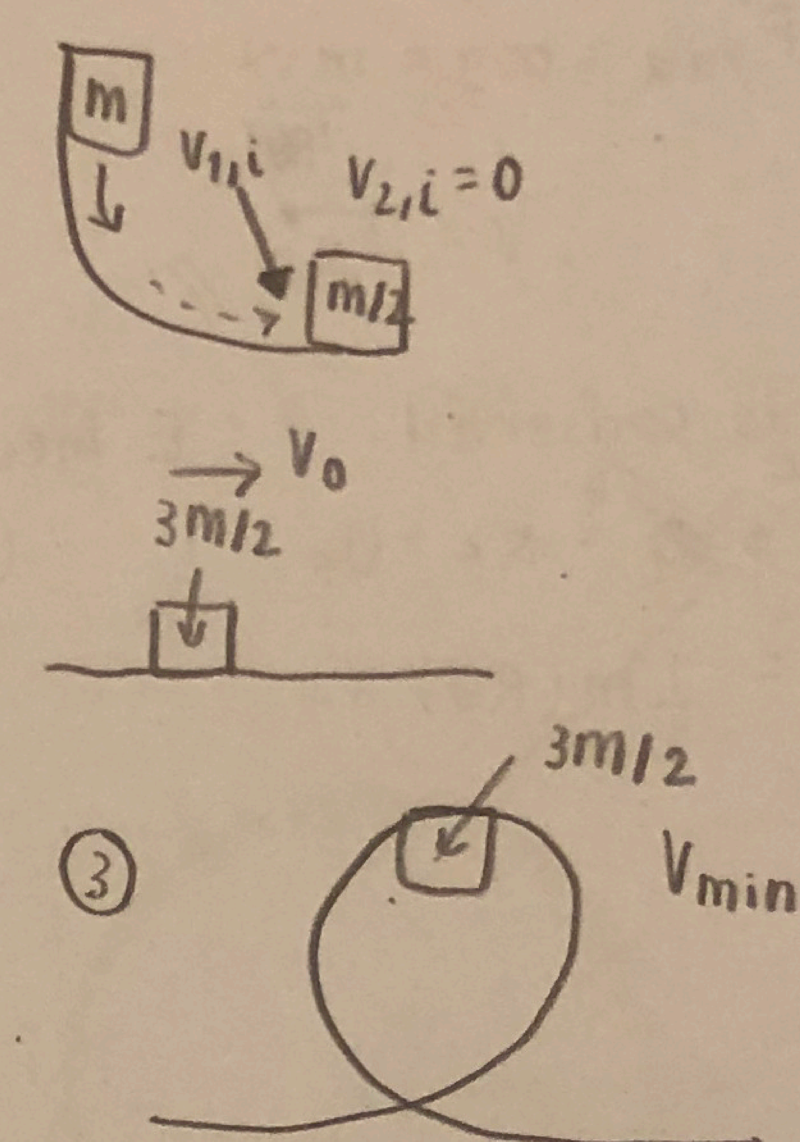
Part B (20 points): A second block of exactly one-half the mass of the original block is now placed at rest at Point A. When the original block is released, it slides down the slope and collides with the second block at Point A. After the collision, the two blocks stick together. Determine the minimum height *h* from which the original block must be released so that the two stuck-together blocks complete the loop without falling off. Express your answer in terms of *R*.

Perfectly inelastic, K.E. is lost





② During collision:

$V_{min} = \sqrt{gR}$

$m_1 V_{1,i} + \cancel{m_2 V_{2,i}}^{\,0} = (m_1 + m_2) V_0$

$m V_{1,i} = \frac{3m}{2} V_0$

$V_{1,i} = \frac{3}{2} V_0 = \cancel{\frac{3}{2}\sqrt{gR}}$

~~From the point where~~ two

① From the point where m_1 is released to before collision

$U_i + \cancel{K_i}^{\,0} = \cancel{U_f}^{\,0} + K_f$

$\cancel{m} g h = \frac{1}{2} \cancel{m} V_{1,i}^2$

$V_{1,i} = \frac{3}{2} V_0 = \cancel{\frac{3}{2}\frac{\sqrt{17Rg}}{2}}\ \frac{3}{2}\sqrt{5Rg}$

$h = \frac{V_{1,i}^2}{2g} = \cancel{\dots}$

$h = \left(\frac{3}{2}\sqrt{5Rg}\right)^2 \cdot \frac{1}{2g}$

$\boxed{h = \frac{45}{8} R}$

$\cancel{h = \frac{9R}{8}}$ $= \cancel{\frac{153R}{32}}$

③ From the point where m_1 and m_2 collide to the top of the loop

$\cancel{U_i}^{\,0} + K_i = U_f + K_f$

$\frac{3m V_0^2}{2 \cdot 2} = \frac{3m}{2} g(2R) + \frac{3m}{2 \cdot 2} V_{min}^2$

$\frac{1}{2}\left(\frac{3m}{2}\right) V_0^2 = \frac{3m}{2} g(2R) + \frac{1}{2}\left(\frac{3m}{2}\right) V_{min}^2$

$\frac{3\cancel{m}}{4} V_0^2 = 3\cancel{m} g R + \frac{3\cancel{m}}{4}(gR)$

$\frac{3}{4} m V_0^2 = \frac{15}{4} R g$

$\cancel{V_0^2 = \frac{4gR + gR}{4} \dots}$ $\cancel{V_0 = \frac{\sqrt{17Rg}}{2}}$

$\frac{3}{4} V_0^2 = \frac{15}{4} R g$

$V_0 = \sqrt{5Rg}$ //

$\boxed{h = \frac{45}{8} R}$ //